CLAIMS

[1] An imaging device comprising:

a MOS image sensor including a light receiving surface made up of a plurality of pixel units arrayed in a plurality of lines;

a detection unit operable to detect a horizontal shift amount in images corresponding to two or more lines from among images on the respective lines read out for each horizontal cycle from said MOS image sensor, ;

a determination unit operable to determine a head position to be a head pixel in at least one line out of the plurality of lines, based on the horizontal shift amount; and

a horizontal compensation unit operable to generate a compensation image based on the determined head position.

[2] The imaging device according to Claim 1

wherein said detection unit is operable to detect the horizontal shift amount of the images corresponding to all adjacent two lines in the plurality of lines.

[3] The imaging device according to Claim 1

wherein said determination unit is operable to determine the head position at least one of the two or more lines, based on the horizontal shift amount.

[4] The imaging device according to Claim 2

wherein said determination unit is operable to determine the head position of the line read out subsequently, between the adjacent two lines of all adjacent two lines, based on the horizontal shift amount.

[5] The imaging device according to Claim 1,

wherein said detection unit includes:

an acceleration sensor operable to detect an acceleration from a movement of said imaging device; and

a calculation unit operable to calculate the horizontal shift amount based on the detected acceleration.

[6] The imaging device according to Claim 5,

wherein said acceleration sensor is operable to detect the acceleration for each horizontal cycle,

said calculation unit is operable to calculate the horizontal shift amount in one horizontal cycle, and

wherein said horizontal compensation unit includes

a read-out unit operable to read pixel signals, whose number is corresponding to the number of horizontal pixels, out of said MOS image sensor starting from the head position determined by said determination unit.

[7] The imaging device according to Claim 1 or Claim 5

wherein said determination unit is operable to determine a head position of the line to be read out based on a head position of the line read out immediately before and the horizontal shift amount from the time of readout immediately before.

[8] The imaging device according to Claim 6,

wherein said determination unit is operable to determine the head position in units of a subpixel, and

said horizontal compensation unit further includes

a horizontal interpolation unit operable to compensate a pixel array in the line read out by said read-out unit to the subpixel by means of pixel interpolation.

[9] The imaging device according to Claim 1 or Claim 5, further comprising:

a storage unit operable to store a frame image read out of said MOS image sensor, and

wherein said horizontal compensation unit is operable to compensate the head position to the frame image stored in said storage unit.

[10] The imaging device according to Claim 9,

wherein said determination unit is operable to determine the head position in units of a subpixel, and

said horizontal compensation unit is operable to compensate the frame image in units of a subpixel by means of pixel interpolation.

[11] The imaging device according to Claim 1,

wherein said detection unit is further operable to detect a vertical shift amount of the image, and

said imaging device further comprises

a vertical compensation unit operable to compensate a distortion expanded and contracted in vertical direction of an image captured in an image unit, based on the detected vertical shift amount.

[12] The imaging device according to Claim 11,

wherein said vertical compensation unit includes:

a line buffer operable to store pixel signals, whose number is corresponding to a plurality of lines read out of said MOS image sensor,

a determination unit operable to determine a compensation line position for each line, based on the vertical shift amount detected by said detection unit, and

a vertical interpolation unit operable to calculate pixel signals at the position of a compensation line by means of pixel

interpolation between lines using pixel signals stored in said line buffer and pixel signals read out from said MOS image sensor.

[13] The imaging device according to Claim 12 wherein said vertical interpolation unit is operable to perform pixel interpolation using the pixel signals in two lines, that are the proximate two lines above and beneath the compensation line position determined by said determination unit.

[14] The imaging device according to Claim 13, further comprising a storage unit operable to store the frame image read out of said MOS image sensor,

wherein said horizontal compensation unit and said vertical compensation unit are operable to compensate the head position to the frame image stored in said storage unit.

[15] The imaging device according to Claim 14,

wherein said detection unit is further operable to detect the vertical shift amount of the image,

said horizontal compensation unit includes:

a determination unit operable to determine the head position at each line based on the horizontal shift amount; and

a relocation unit operable to relocate the frame image stored in said storage unit based on the determined head position, and

said vertical compensation unit includes:

a determination unit operable to determine the compensation line position at each line based on the vertical shift amount; and

a vertical interpolation unit operable to calculate the pixel signal for the position of an interpolation line by means of pixel interpolation between lines to the frame image relocated by the relocation unit.

[16] The imaging device according to Claim 15,

wherein said detection unit is further operable to detect a position shift amount between two frames stored in said storage unit, and

said horizontal compensation unit and said vertical shift unit are operable to compensate the position shift between frames based on the position shift amount.

[17] An imaging method for an imaging device which includes a MOS image sensor having a light receiving surface made up of a plurality of pixel units arrayed in a plurality of lines, said imaging method comprising:

a detection step of detecting a horizontal shift amount in images corresponding to two or more lines from among images on the respective lines read out for each horizontal cycle from the MOS image sensor;

a determination step of determining a head position to be a head pixel in at least one line out of the plurality of lines, based on the horizontal shift amount; and

a read-out step of reading out a line based on the determined head position.

[18] The imaging method according to Claim 17,

wherein said detection step comprises detecting the horizontal shift amount of the images corresponding to all adjacent two lines in the plurality of lines.

[19] The imaging method according to Claim 17,

wherein said determination step comprises determining the head position at least one of the two or more of the lines, based on the horizontal shift amount.

[20] The imaging method according to Claim 18,

wherein said determination step comprises determining the head position of the line read out subsequently, between the adjacent two lines of all adjacent two lines, based on the horizontal shift amount.

[21] The imaging method according to Claim 17,

wherein said detection step comprises:

detecting an acceleration from a movement of the imaging device by an acceleration sensor; and

a calculation step of calculating a horizontal shift amount based on the detected acceleration.

[22] The imaging method according to Claim 21,

wherein the acceleration sensor detects the acceleration for each horizontal cycle,

said calculation step comprises calculating the horizontal shift amount in one horizontal cycle, and

said horizontal compensation step comprises:

a read-out step of reading pixel signals, whose number is corresponding to the number of horizontal pixels, out of the MOS image sensor starting from the head position determined by said determination step.

[23] The imaging method according to Claim 17 or Claim 21

wherein said determination step comprises determining a head position of the line to be read out based on a head position of the line read out immediately before and the horizontal shift amount from the time of readout immediately before.

[24] The imaging method according to Claim 22,

wherein said determination step comprises determining the

head position in units of a subpixel, and

said horizontal compensation step further comprises

a horizontal interpolation step of compensating a pixel array in the lines read out by said read-out step to the subpixel by means of pixel interpolation.

[25] The imaging method according to Claim 17 or Claim 21, further comprising,

a storage step of storing a frame image read out of the MOS image sensor in a memory,

wherein said horizontal compensation step comprises compensating the head position to the frame image stored in the memory.

[26] The imaging method according to Claim 25,

wherein said determination step comprises determining the head position in units of a subpixel, and

said horizontal compensation step comprises compensating the frame image in units of a subpixel by means of pixel interpolation.

[27] The imaging method according to Claim 17,

wherein said detection step further comprises detecting a vertical shift amount of the image, and

the imaging device further comprises

a vertical compensation step of compensating a distortion expanded and contracted in vertical direction of an image captured in an image step, based on the detected vertical shift amount.

[28] The imaging method according to Claim 27,

wherein said vertical compensation step comprises:

a determination step of determining a compensation line

position for each line based on the vertical shift amount detected by said detection step; and

a vertical interpolation step of calculating pixel signals at the position of compensation line by means of pixel interpolation between lines using pixel signals in the line stored in a line buffer for storing pixel signals, whose number is corresponding to a plurality of lines read out from the MOS image sensor, and the pixel signal read out from the MOS image sensor.

[29] The imaging method according to Claim 28,

wherein said vertical interpolation step comprises performing pixel interpolation using the pixel signals in two lines, that are the proximate two lines above and beneath the compensation line position determined by said determination step.

[30] The imaging method according to Claim 29,

wherein the imaging device further includes a storage step of storing the frame image read out from the MOS image sensor to a memory, and

said horizontal compensation step and said vertical compensation step comprise compensating the head position to the frame image stored in the memory.

[31] The imaging method according to Claim 30,

wherein said detection step further comprises detecting a vertical shift amount of the image, and

said horizontal compensation step comprises:

a determination step of determining the head position at each line based on the horizontal shift amount; and

a relocation step of relocating the frame image stored in the memory based on the determined head position,

said vertical compensation step comprises:

a determination step of determining the compensation line position at each line based on the vertical shift amount; and

a vertical interpolation step of calculating the pixel signal for the position of interpolation line by means of pixel interpolation between lines to the relocated frame image.

[32] The imaging method according to Claim 31,

wherein said detection step further comprises detecting a position shift amount between two frames stored in said storage step, and

said horizontal compensation step and said vertical shift step comprises compensating the position shift between frames based on the position shift amount.